Relationship between obesity and socioeconomic demographics

Chapter Five: Discussion

The prevalence as well as the severity of obesity in adolescents is increasing at an alarming rate, making it one of the most serious health problems affecting this age group. In this study, a total of 161 adolescents (15. 6%) were overweight and 224 ones(21. 6%) were obese.

A study conducted by National Health and Nutrition Examination Survey (NHANES 1999-2000) showed thatapproximately 30% of adolescents were at risk for overweight and 14% were severely overweight or obese (Troiano and Flegal, 1999). In this study, the prevalence of overfat was 9. 1% and obesity was 21. 8%. A study conducted by Lee *ea al.* (2006) showed thatthe prevalence of total 555 adolescentboys were overfat (20. 4%) and 8. 3% were obese. In our study, prevalence of obese adolescents, according to both BMI and total fat, was higher than overweight; this could be attributed to high rate of fast food consumption among adolescents 72%. Fraser et al. (2012) conducted a study in the United Kingdom and observed anassociation between obese adolescents and fat food consumption. The prevalence of waist circumferences≥90 th percentile in this study was 9. 4%. This is consistent with Spain’s result, prevalence of waist circumferences≥90 th percentile among adolescents was 11. 6% (Schröder et al., 2014).

Association between anthropometric measurements and socio-demographic characteristics:

In our study, the BMI was significantly related to family income (p= 0. 004). About 25. 7% of obese adolescents had families whose income was > 800 JD

after adjusting variables effects of results including age, smoking and physical activity. Shafaghi *et al* . (2014) studied the relationship between BMI and family income, 22. 4% of obese adolescents were from families whose income was high.

Total fat was significantly associated with adolescents age (p= 0. 027). Adolescents aged ≥12 and ≤14 years old were more predictable to have high fat percentage (25. 6%) than adolescents aged ≥ 15 and ≤17 years (18. 9%). This finding was consistent with Northstone *et al.* (2014). In our study, total fat was related to family income significantly (p= 0. 022). Kubik *et al* . (2003) conducted a study of 844 students; the study showed that students with high family income tended to consume sweetened beverages and high-fat snacks.

Region affected significantly total fat among adolescents (p= 0. 049). The prevalence of obese adolescents were higher in middle area than north and south areas; that could be attributed to high fast food intake in middle area (48. 2%) comparing to north and south areas (35. 3% and 16. 6%respectively). Limited data to explain relation between body fat content with father’s and mother’s education.

Trunk fat was significantly associated with adolescents age (p= 0. 027). Adolescents aged ≥12 and ≤14 years old were more predictable to have high trunk fat (15. 4%) than adolescents aged ≥ 15 and ≤17 years (10. 8%). Fox *et al.* (2000) reported thatadolescents aged 11- 13 years were associated with high trunk fat using magnetic resonance imaging (MRI).

Association between blood pressure and socio-demographic characteristics:

Blood pressure was significantly related to adolescents' age (p <0. 01). This relation showed that 35. 7% of adolescents aged ≥ 15 and ≤17 years had stage 2 HT compared to only 20. 3% among adolescents aged ≥12 and ≤14 years old had stage 2 HT. Moura *et al* . (2004) concluded a study on 898 adolescents, prevalence of elevated blood pressure in students aged ≥ 15 and ≤17 years was more than students aged ≥12 and ≤14 years.

Effect of food categories on the prevalence of blood pressure among adolescents:

Fruit and vegetables consumption were significantly related to blood pressure (p= 0. 008 and p= 0. 033 respectively). This finding was consistent with the findings of studies (Whelton et al., 1997, Whelton et al., 2005, Appel et al., 2006, Witham et al., 2009). Apple *et al* . (2006) studied the contents offruit and vegetables from vitamins, minerals and fibers. Fruits and vegetablesalso contained potassium; their increase in potassium intake was associated with significantly reduction in blood pressure. The increase in potassium intake had same lowering effect on blood pressure as decrease in sodium intake. Potassium had a major role in balancing out the negative effects of sodium. Whelton *et al* . (1997) recommended potassium for prevention and treatment of hypertension. Increasing serum levels of vitamins A, C, E (Appel et al., 2006)and D (Witham et al., 2009)were associated with lowering blood pressure. Meta-analysis suggested that increasing the dietary fiber intake had a lowering effect on blood pressure (Whelton et al., 2005). According to this study, chocolate was significantly related to blood pressure (p= 0. 013). Studies explained chocolate's role to lower blood pressure (Fisher and Hollenberg, 2006, Karim et al., 2000,

Taubert et al., 2007). Chocolate contained cocoa that include polyphenols specially flavanols. Strong effects of flavnols on blood pressure as a vasodilator were applied by increasing the formation of endothelial nitric oxide.

Families' health status effect on adolescent's blood pressure:

Father's and mother's health status was significantly associated with blood pressure in adolescent (p= 0. 002, p= 0. 022 respectively). Many studies (Din-Dzietham et al., 2007, Dasgupta et al., 2006, Martin et al., 2004) confirmed that family history of hypertension and cardiovascular disease were risk factors for elevated blood pressure among adolescents. Family history of obesity including fathers' and siblings' obesity was significant with adolescents'blood pressure (p= 0. 004 and p= 0. 048respectively). Falkner. (2010) reported a positive relation between blood pressure among adolescents and family history of obesity.

Association between blood pressure and anthropometric measurements:

Alton. (2005) considered hypertension one of obesity risk factors. Lu et al. (2013) conducted a study in China, and found out that the risk of elevated blood pressure prevalence was 1. 5 folds in overweight children and was 2. 2 folds in obese children. High BMI increased the risk of insulin resistance. Endothelial dysfunction and inflammation led to elevated blood pressure mediated bythe increase sympathetic nervous system (SNS) activity (Tsioufis et al., 2011, Poirier et al., 2006). Our findings confirmed previous findings of high odds of stage 1 systolic hypertension among overweight adolescents 1.

8 folds and 2. 7 folds in obese adolescents, adjusting for confounding variables -age, smoking status and physical activity.

Our result observed that adolescents with waist circumferences ≥90th percentile proportionally related to increase in blood pressure. Lu et al. (2013) reported a high significant association (p <0. 001) between waist circumferences and blood pressure.

Increase in total body fat in our study was significant with increase in blood pressure proportionally. Pre-HTN, stage 1 HTN and stage 2 HTN were significant (p= 0. 009, p= 0. 004 and p <0. 001respectively). He *et al* . (2002)used DEXA and skinfolds to estimate total body fat and it's relation asa predictor for blood pressure among adolescentboys unlike girls.

Landsberg et al. (2013) explained that pathophysiology of fat accumulation in abdominal region led to an increase in blood pressure by increases in insulin secretion, (SNS) activity, renin-angiotensin-aldosterone system activity, angiotensinogen from intra-abdominal adipocytes, aldosterone production and renal sodium reabsorption. Our findings confirmed previous findings of high odds of stage1 systolic hypertension among adolescents with trunk fat ≥90th percentile had 4 times higher odds of having stage 1 systolic hypertension (CI 2. 2, 7. 1) and 5. 5 higher odds of having stage 2 systolic hypertension (CI 3. 4, 9. 1).

An association between adolescents visceral fat with blood pressure was observed among boys contrary girls (Pausova et al., 2012). Matsuzawa *et al* . (1995) explained increase that the in visceral fat to induce high level of free fatty acid excretion in liver via portal circulation after lipogenesis and

lipolysis activity, gluconeogenesis, lipid synthesis and insulin resistance were response actions causedby excusive free fatty acid to induce hypertension and eventually atherosclerosis. Our results confirmed previous findings of high odds of stage 2 systolic hypertension among adolescents with visceral fat ≥90th percentile by 7. 2 folds.

Conclusion:

The prevalence of total, truncal and visceral fat in our study were high. Excessfat, especially visceral fat significantly increased the risk for systolic blood pressure individually in older adolescents. The physiological relation between obesity and hypertension could not be attributed to a single factor. Factors that minimized the activity of renin-angiotensin-aldosterone system, sympathetic nervous system and renal sodium excretion had to be controlled, primarily the factors caused by excess fat. This finding based on measures of fat distribution and blood pressure in adolescent boys is important to help tracks cardiovascular risks from adolescence to adulthood.

Strength of the Study

1. This research has been conducted for the first time in Jordan to explain the prevalence and relationship between adolescents’ blood pressure and fat distribution.
2. The study depends on data collected from a large sample that is representative to Jordan as a whole.

Limitation of the Study

An addition of a 24-hour recall form with this study combined with study's FFQ could be more precise to estimate dietary and lifestyle habits among adolescents.

Recommendations:

1. Serious policies and actions for the sake of prevention, control weight and body fat specially as risks for elevated blood pressure, should be taken to apply an appropriate intervention on affected adolescents.
2. Raise the schools' role is for mass public enlightenment and health education on the threats of some nutritional behavior and lifestyle.